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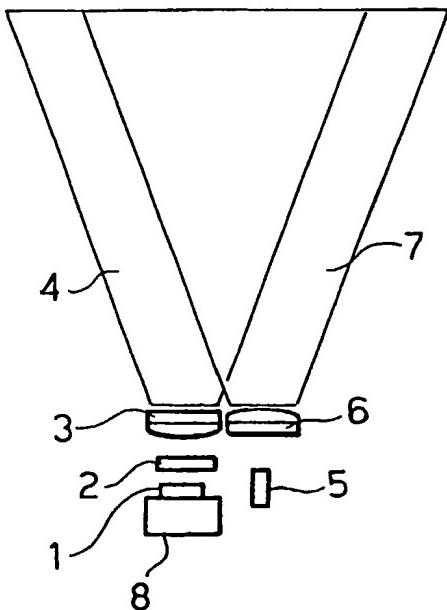
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
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[Continued on next page]

(54) Title: AN ACTIVE ELECTRO-OPTICAL DEVICE FOR DETECTING OBSTACLES, IN PARTICULAR FOR AUTONOMOUS NAVIGATION



(57) Abstract: An electro-optical system capable of being embarked aboard mobile ground or flying units, to determine the optical flow generated by obstacles in relative motion with respect to the mobile unit. The system comprises radiation (5), receiver means (1) for converting the radiation reflected by the objects into electrical signals and means (8) for processing the signals generated by the receiver means. The receiver means (1) are based on vision sensors with matrix configuration. The emitter means (5, 6) shape the radiation beam in such a way that the radiation reflected by the objects and collected by the receiver means impacts at least on a part of the receiver matrix. The processing means compute the optical flow only on the elements of the receiver matrix that are impacted by the radiation.

WO 2004/081598 A3



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,  
ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/000601

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 G01S17/89 G01C11/02 G06T7/20

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01S G01C G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PARK S-B ET AL: "A motion detection system based on a CMOS photo sensor array" IMAGE PROCESSING, 1998. ICIP 98. PROCEEDINGS. 1998 INTERNATIONAL CONFERENCE ON CHICAGO, IL, USA 4-7 OCT. 1998, LOS ALAMITOS, CA, USA, IEEE COMPUT. SOC, US, 4 October 1998 (1998-10-04), pages 967-971, XP010586845 ISBN: 0-8186-8821-1	1-6, 21-25
Y	----- -/-	8-14

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
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- "P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

8 July 2004

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06.10.2004

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## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IB2004/000601

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CHIH-HO YU ET AL: "Determination of horizontal motion through optical flow computations" OCEANS '93. ENGINEERING IN HARMONY WITH OCEAN. PROCEEDINGS VICTORIA, BC, CANADA 18-21 OCT. 1993, NEW YORK, NY, USA, IEEE, 18 October 1993 (1993-10-18), pages II475-II480, XP010117554 ISBN: 0-7803-1385-2	1-6, 21-25
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Y	WO 01/96147 A (AUTOMOTIVE SYSTEMS LAB) 20 December 2001 (2001-12-20) figures 4,5 -----	8-14
X	EP 1 256 816 A (ARETE ASSOCIATES INC) 13 November 2002 (2002-11-13) abstract paragraphs [0034], [0036], [0049], [0118] figure 2 -----	1-5

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IB2004/000601

### Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-14, 21-25

#### Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-14,21-25

active optical flow system with shaped beam

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2. claims: 15-20

active optical flow system with plurality of sources

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No  
PCT/US2004/000601

Patent document cited in search report	Publication date		Patent family member(s)		Publication date
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			EP 1256816 A2		13-11-2002
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